3.2.3 Equilibrium

	Learning outcomes	Additional guidance
	Learners should be able to demonstrate and apply their knowledge and understanding of:	
(a)	moment of force	
(b)	couple; torque of a couple	
(c)	the principle of moments	
(d)	centre of mass; centre of gravity; experimental determination of centre of gravity	
(e)	equilibrium of an object under the action of forces and torques	
(f)	condition for equilibrium of three coplanar forces; triangle of forces.	*M4.1, M4.2, M4.4*

(6) M - Define the term centre of mass and centre of gravity
(7) S - Describe the usefulness of these terms.
(8) C - Describe an experiment to determine the centre of gravity of an irregular object.

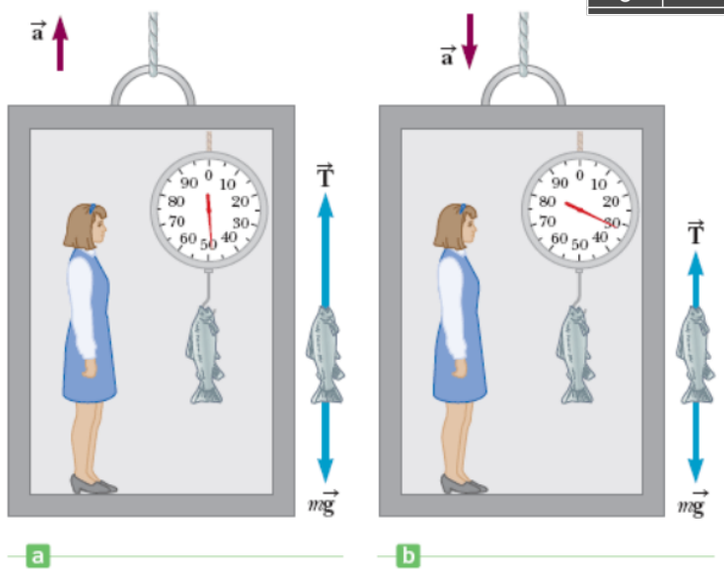
Lesson 2 Centre of mass

STARTER: A woman weighs a fish with a spring scale attached to the ceiling of an elevator, as shown in the figures. While the elevator is at rest, she measures a weight of 36.0 N.

(a) What weight does the scale read if the elevator accelerates upward at 1.80 m/s2?
(b) What does the scale read if the elevator accelerates downward at 1.80 m/s2, as in figure (b)?
(c) If the

0:00:00

Answers



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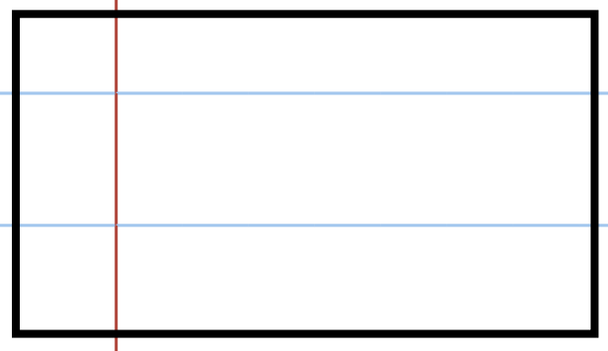
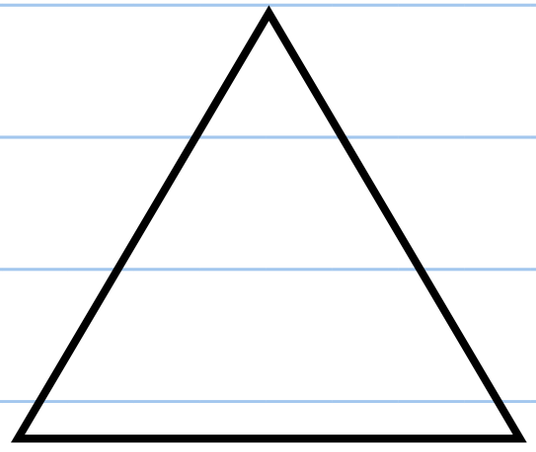
Lesson 2 Centre of mass

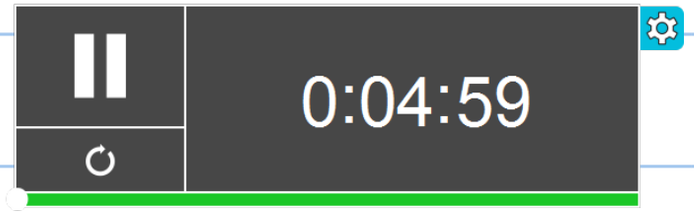
centre of mass in space
start 4.36

Activity: Watch the video / read page 40

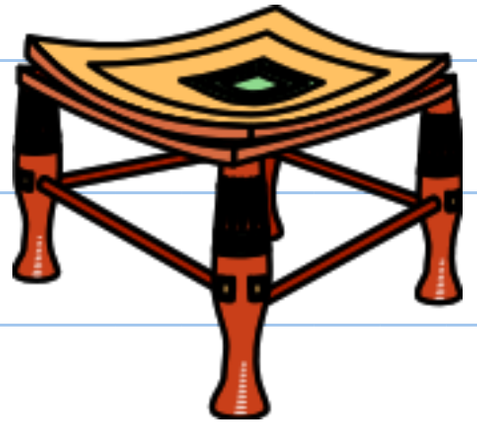
1. What is the centre of mass of an object?
   Use an example to illustrate your answer.
2. What is the centre of gravity of an object?
3. What are the benefits of simplifying object to find their centre of mass/gravity?







Demo: Find centre of mass of clamp stand with meter rule



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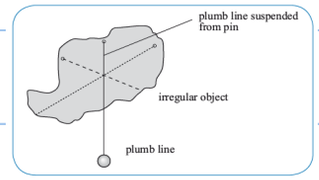
Lesson 2 Centre of mass

Practical activity: Watch the video / read pag 49

'A freely suspended object will come to rest with the centre of mass below the point of suspension.'

1. Cut out an irregular shape using card. Estimate the centre of mass.
2. Find the centre of mass by practical means.
3. Check by balancing that your centre of mass is correct.
4. Stick in and label the centre of mass.
5. Make a flow map of the steps in this practical



Ex: Explain how you could find the centre of mass of an object where there is no detectable gravity

Answer

5 Push the object with the point of a pencil (or equivalent) and by trial and error determine the point on the object where the object does not rotate when pushed. [1]

The centre of mass will lie along the line of action of the force applied by the pencil when there is no rotation. [1]

Repeat this procedure from a different orientation. [1]

The centre of mass is located at the point of intersection of these two (imaginary) lines of action. [1]

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Lesson 2 Centre of mass

Plenary

1. What is the centre of mass?
2. What is the centre of gravity?
3. how do you find the centre of gravity of an irregular object?
4. 2 uses for physicists for centre of gravity.

5. Explain how knowledge of centre of mass can help this person?